Addition and subtraction of like fractions

Show each of the following with fraction pieces.

1. $\frac{1}{4}+\frac{2}{4}=$ $1\ fourth+2\ fourths=$

2. $\frac{2}{5}+\frac{2}{5}=$ $2\ fifths+2\ fifths=$

3. $\frac{3}{6}+\frac{2}{6}=$ $3 sixths+2 sixths=$

Use what you have discovered to solve the following without fraction circle pieces.

4. $\frac{2}{7}+\frac{3}{7}=$ $2 sevenths+3 sevenths=$

5. $\frac{5}{11}+\frac{4}{11}=$ $5 elevenths+4 elevenths=$

Show the first fraction and take away the second. What is left?

1. $\frac{3}{4}-\frac{1}{4}=$ $3\ fourths-1\ fourth=$

2. $\frac{7}{8}-\frac{2}{8}=$ $7 eighths-2 eighths=$

3. $2\frac{3}{5}-1\frac{2}{5}=$ $2\ and\ 3\ fifths-1\ and\ 2\ fifths=$

4. $3\frac{2}{3}-1\frac{1}{3}=$ $3 and 2 thirds-1\ and\ 1\ third=$

Use what you have discovered to solve the following without fraction circle pieces.

5. $3\frac{6}{7}-1\frac{3}{7}=$ $3 and 6 sevenths-1 and 3 sevenths=$

Addition of unlike fractions

Take $\frac{1}{2}$ and $\frac{1}{4}$ to show $\frac{1}{2}+\frac{1}{4}$. Trade fraction pieces so that both fractions have the same denominator. Change the addition equation and write the answer.
Do the same for: $\frac{2}{6}+\frac{1}{2}$. Do the same for: $\frac{3}{4}+\frac{5}{8}$

Add. Use fraction pieces, if needed.

$\frac{1}{3}$ $+\frac{1}{3}$ 1 *third* + 1 *third* =	$\frac{1}{4}$ $+\frac{2}{4}$ 1 fourth + 2 fourths =	$\frac{3}{8}$ $+\frac{5}{8}$ 3 eighths + 5 eighths =	$\frac{2}{3}$ $+\frac{2}{3}$ 2 thirds + 2 thirds =
$\frac{1}{2}$ $+\frac{1}{3}$	$\frac{1}{4}$ $+\frac{1}{2}$	$\frac{1}{2}$ $+\frac{5}{6}$	$\frac{1}{4}$ $+\frac{7}{8}$
$\frac{3}{4}$ $+\frac{1}{2}$	$\frac{3}{8}$ $+\frac{3}{4}$	$\frac{1}{8}$ $+\frac{1}{2}$	$\frac{1}{2}$ $+\frac{5}{8}$
$\frac{1}{4}$ $+\frac{2}{3}$	$\frac{1}{2}$ $+\frac{7}{8}$	$\frac{3}{4}$ $+\frac{5}{8}$	$\frac{1}{2}$ $+\frac{1}{6}$

Subtraction of fractions with unlike denominators

Show one half. To take one-third from the half, trade fraction pieces so that both fractions have the same denominator. Change the fraction subtraction equation and write the answer.

$$\frac{1}{2} - \frac{1}{3} =$$

Do the same for:

$$\frac{2}{3} - \frac{1}{2} =$$

Do the same for:

$$\frac{3}{4} - \frac{5}{8} =$$

Do the same for:

$$\frac{5}{6} - \frac{1}{2} =$$

Without using fraction circle pieces and changing both fractions to the same denominator, find the differences.

$$\frac{5}{9} - \frac{1}{3} =$$

$$\frac{3}{4} - \frac{2}{3} =$$

Addition and subtraction of mixed numbers

Show with fraction pieces. Trade pieces when necessary.

$3\frac{3}{5}+1\frac{4}{5}=$ $2\frac{1}{2}+4\frac{3}{4}=$ $3\frac{3}{4}+1\frac{2}{3}=$

Use what you have learned to solve these without fraction circle pieces.

$1\frac{4}{7}+1\frac{4}{7}=$ $2\frac{2}{3}+1\frac{3}{4}=$

Show 3 wholes. To take $1\frac{2}{3}$ from 3, trade 1 whole circle for thirds first. Then take $1\frac{2}{3}$. What is left?

$$\begin{array}{r} 3 \\ -1\frac{2}{3} \\ \hline \end{array} \qquad \begin{array}{r} 2\frac{?}{3} \\ -1\frac{2}{3} \\ \hline ?\frac{?}{?} \end{array}$$

Write the new problem and solve it.

Solve $\begin{array}{r} 4 \\ -2\frac{5}{6} \\ \hline \end{array}$ Use what you have discovered to solve the following: $\begin{array}{r} 4 \\ -1\frac{2}{9} \\ \hline \end{array}$

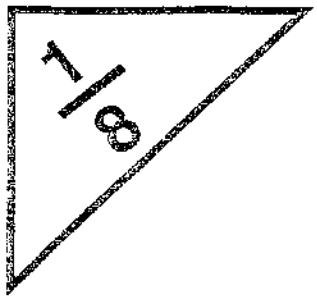
Show each subtraction problem with fraction pieces. Trade when necessary. Rewrite each subtraction problem and solve it.

$$\begin{array}{r} 3\frac{1}{4} \\ -1\frac{1}{2} \\ \hline \end{array} \qquad \begin{array}{r} 4\frac{1}{2} \\ -1\frac{5}{6} \\ \hline \end{array} \qquad \begin{array}{r} 3\frac{1}{4} \\ -1\frac{5}{8} \\ \hline \end{array}$$

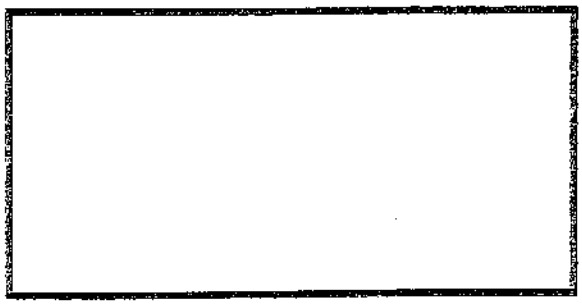
Use what you have discovered to solve the following without fraction circle pieces:

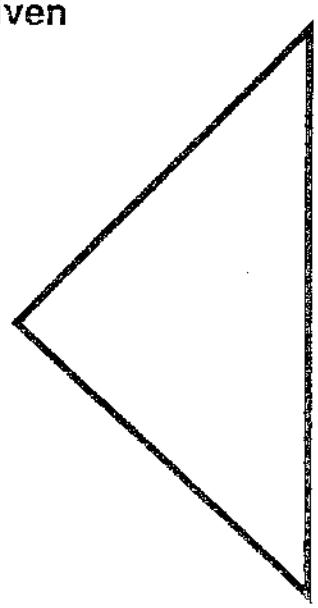
$$\begin{array}{r} 5\frac{1}{4} \\ -2\frac{2}{3} \\ \hline \end{array}$$

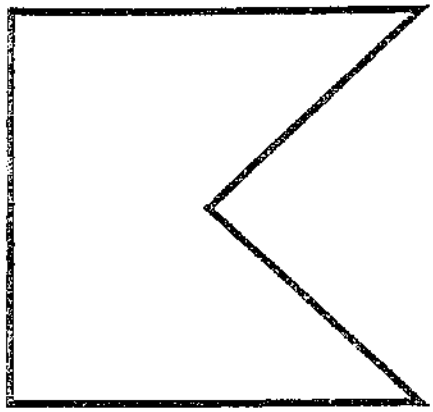
This piece is $\frac{1}{8}$.

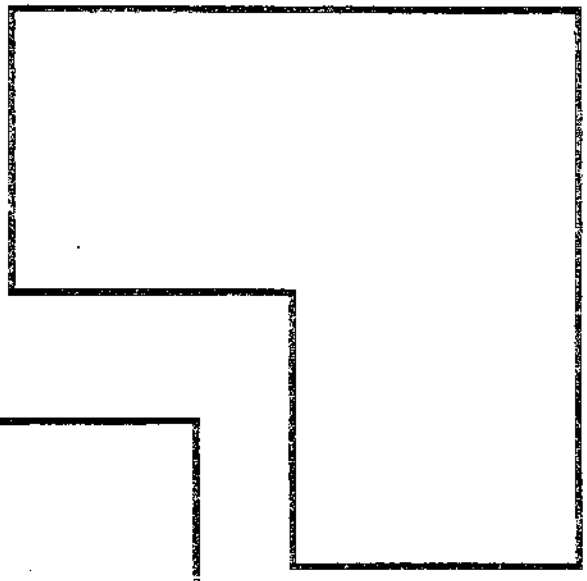


What fraction name can be given to each of these pieces?

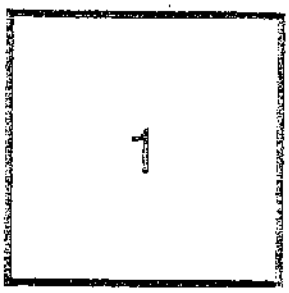






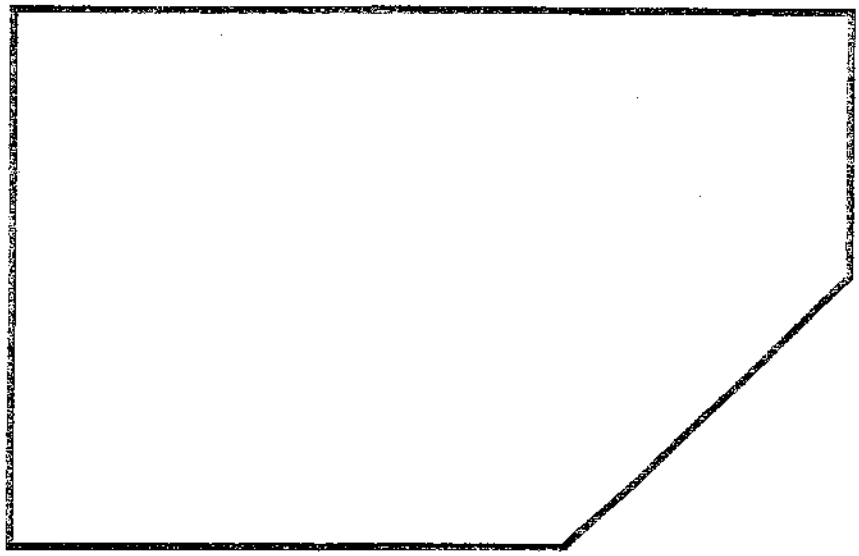


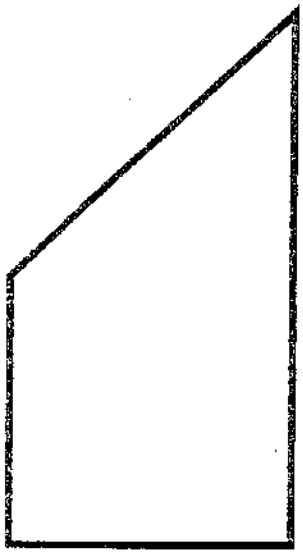
This piece at the right is one whole.

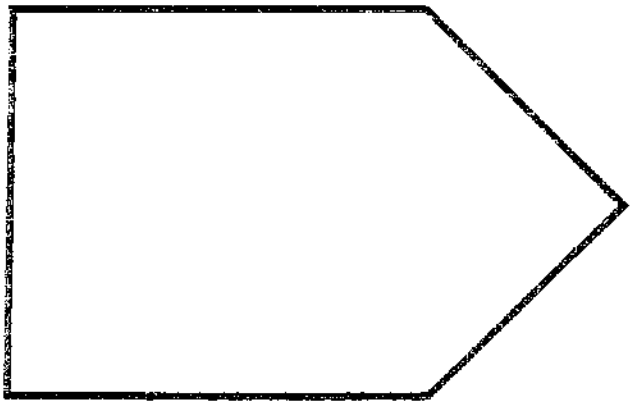


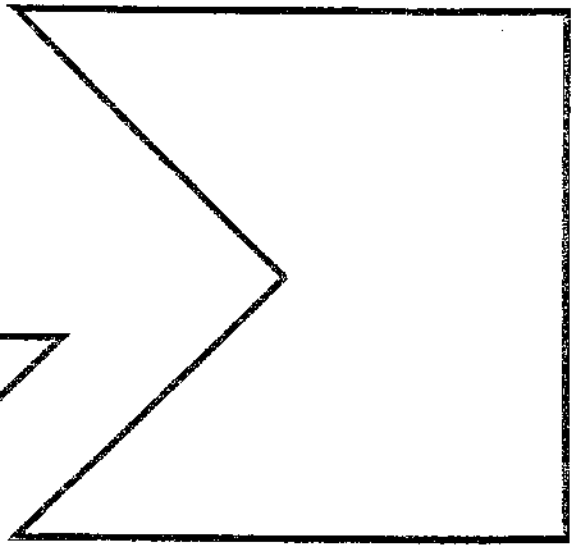
What fraction names can be given to the pieces below?

Hint: What is the fraction name for the small triangle?

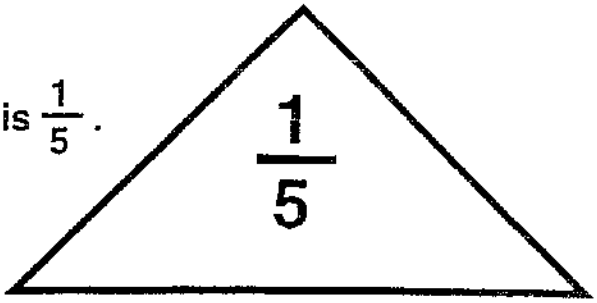




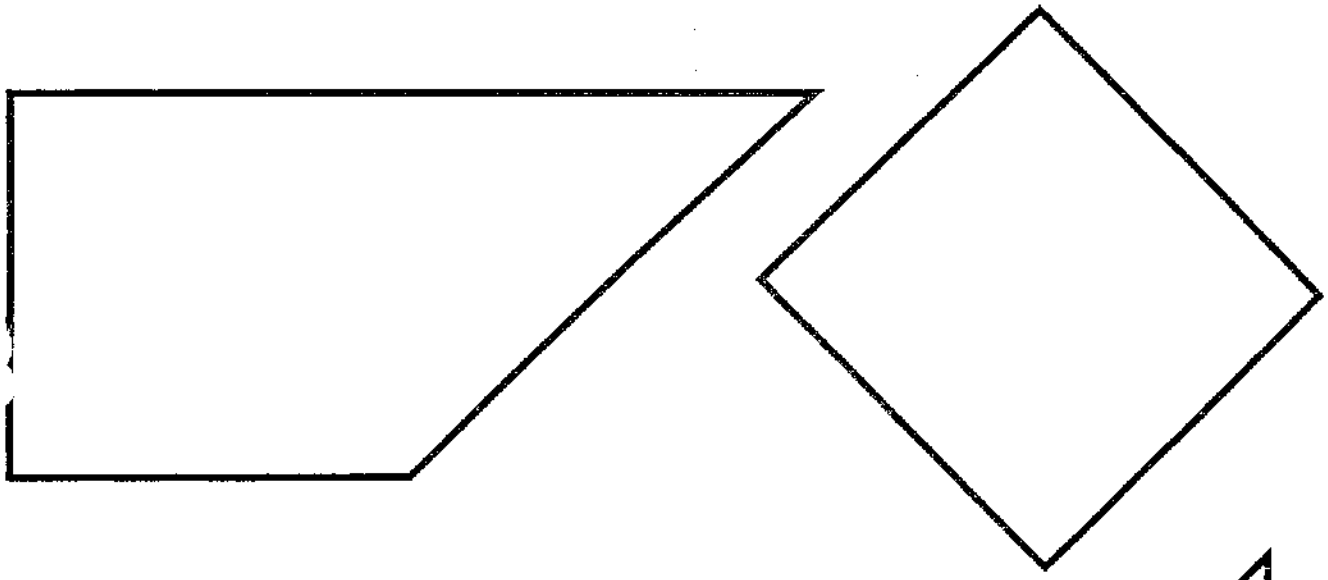


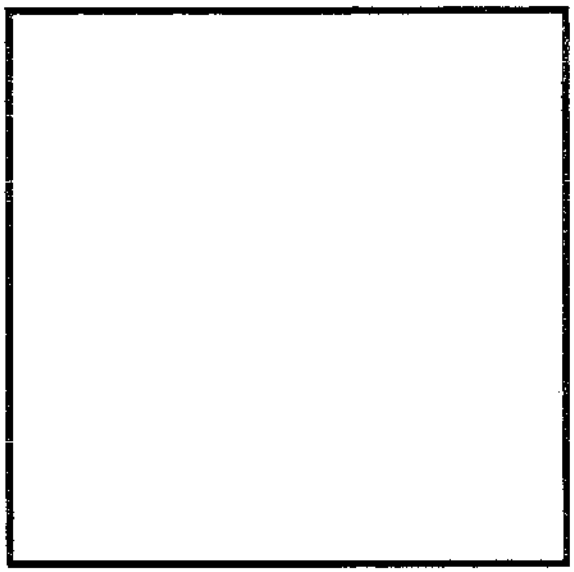


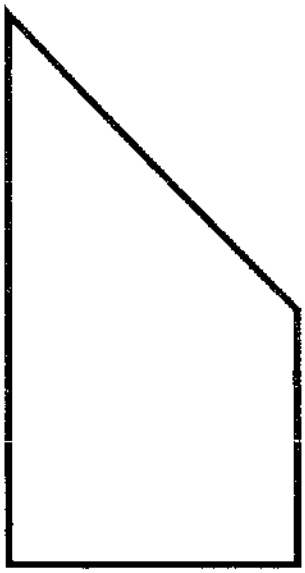
This piece is $\frac{1}{5}$.

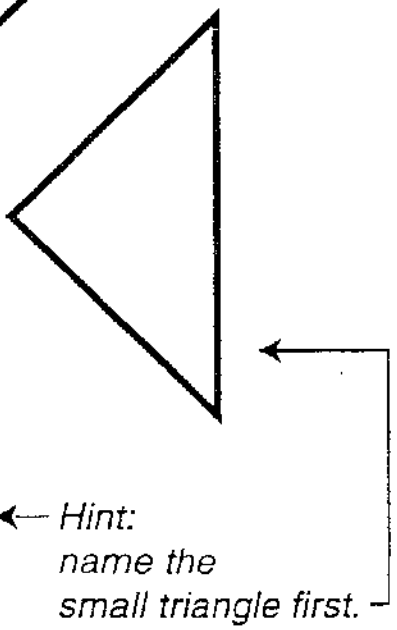


Then, what fraction is each of these pieces?



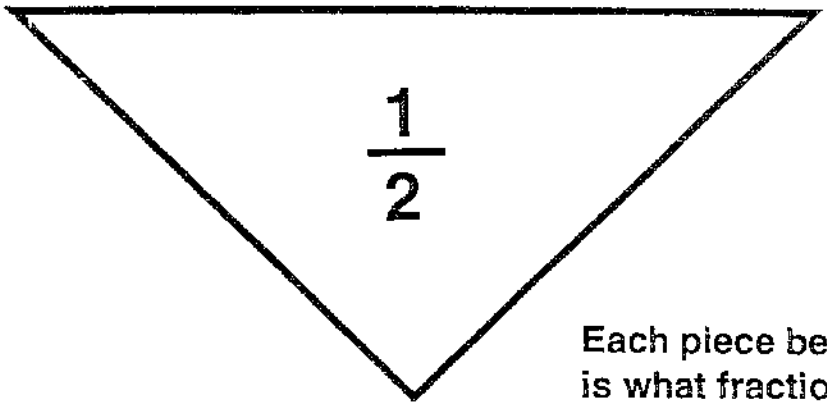




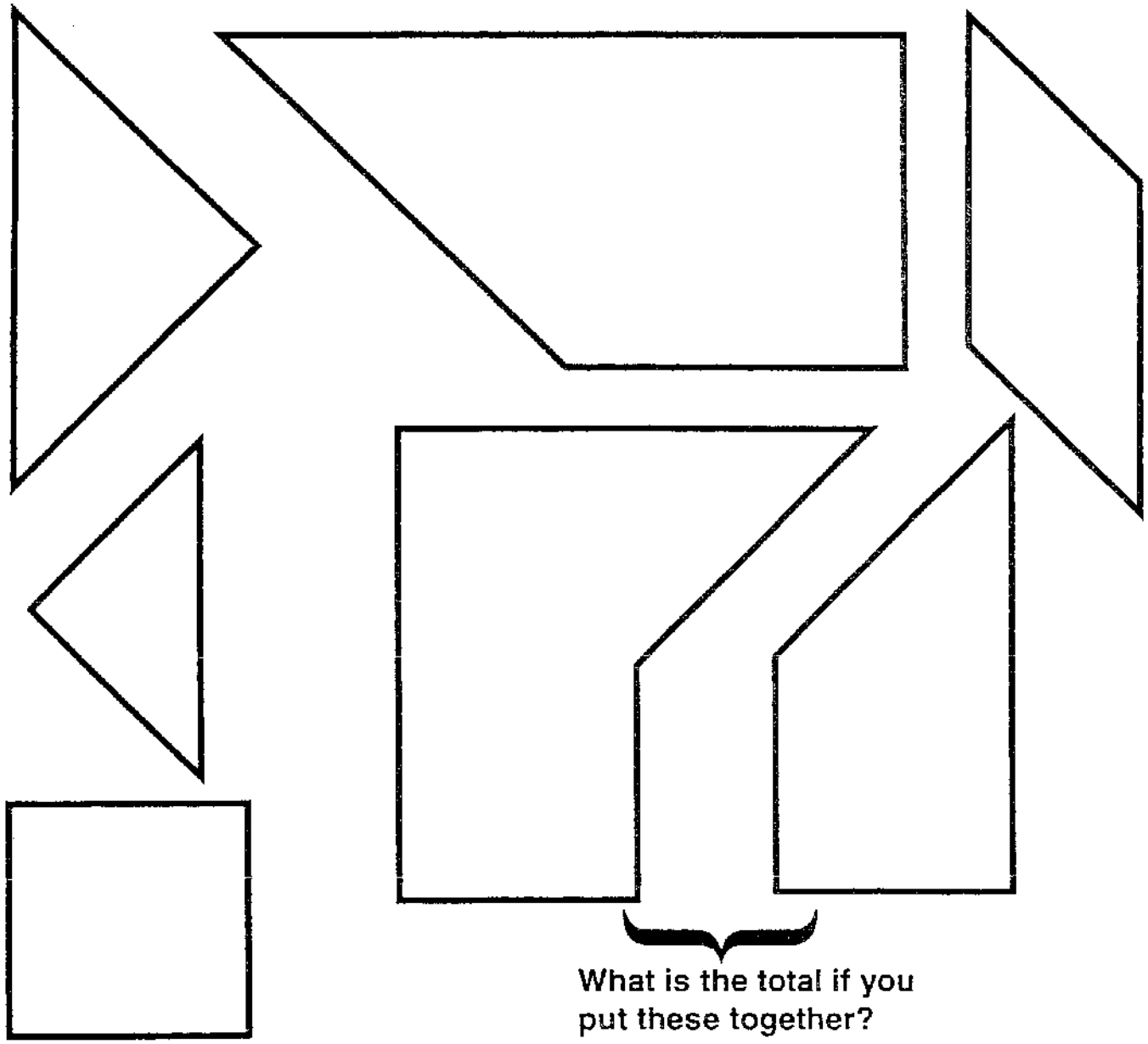


← *Hint: name the small triangle first.*

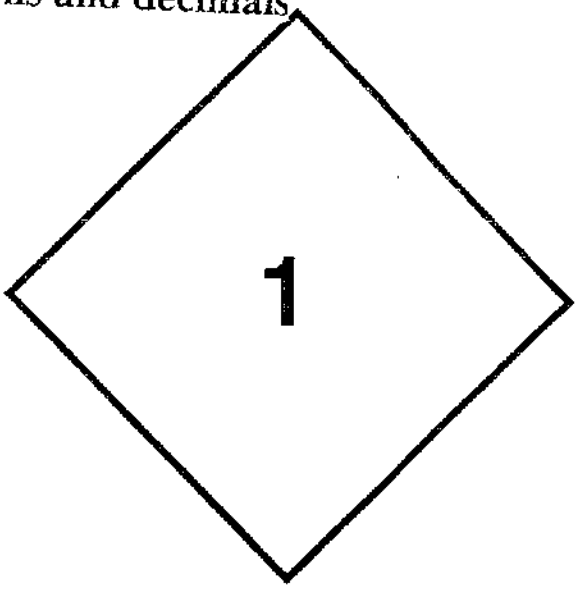
This large tangram triangle is $\frac{1}{2}$.



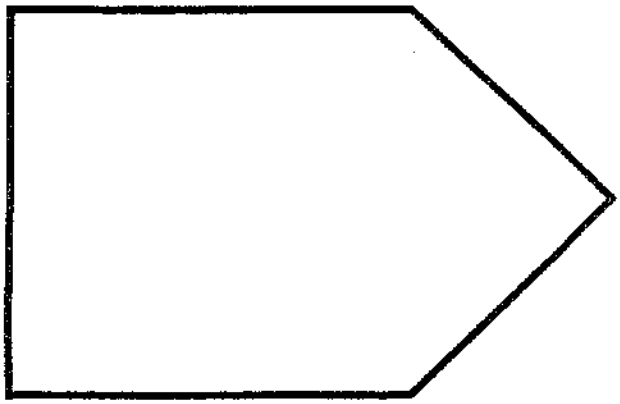
Each piece below is what fraction?

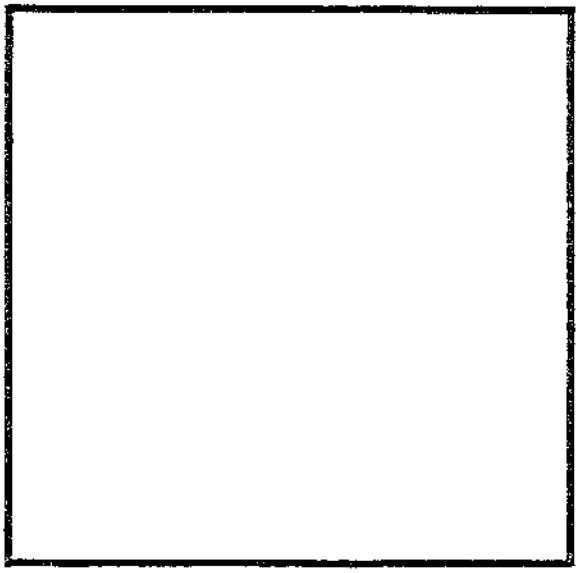


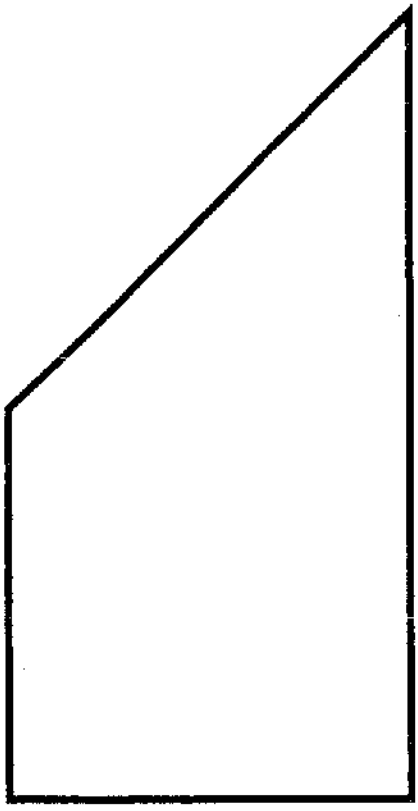
What is the total if you put these together?

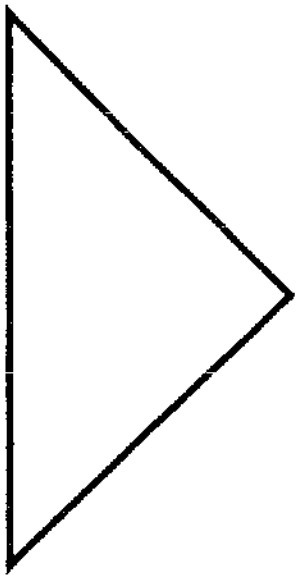


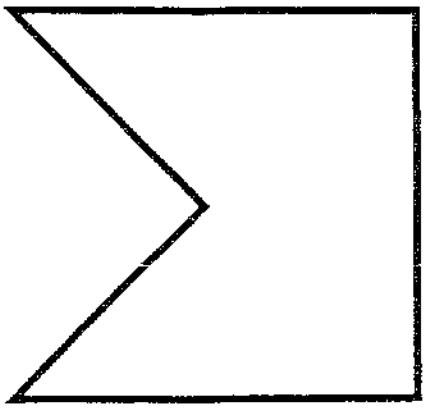
If that's the whole thing, what fraction will the pieces below be?



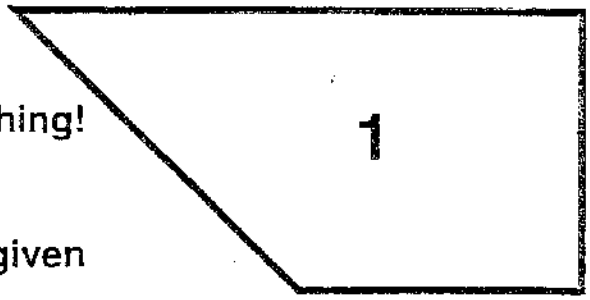




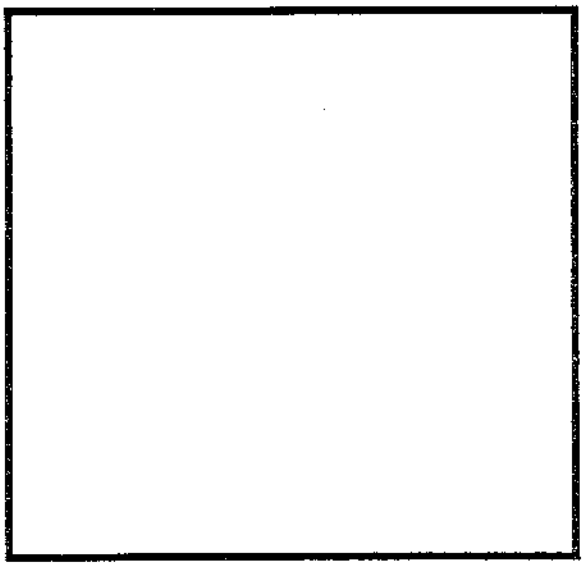


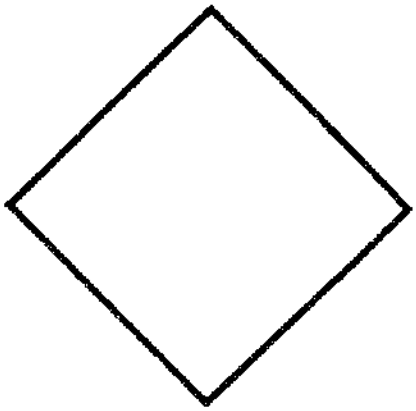


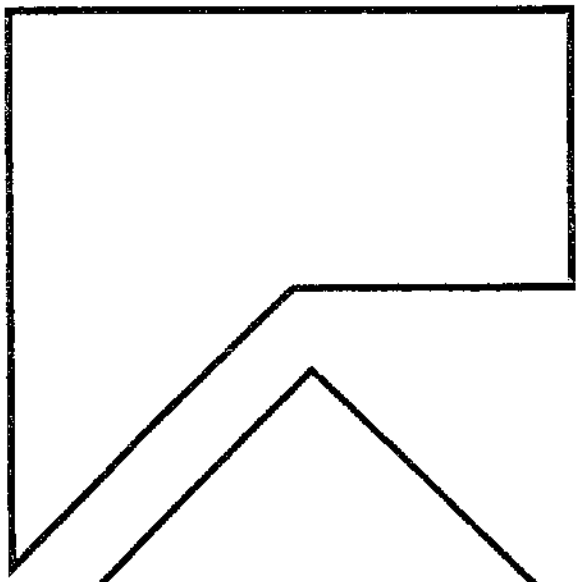
That's a whole thing!

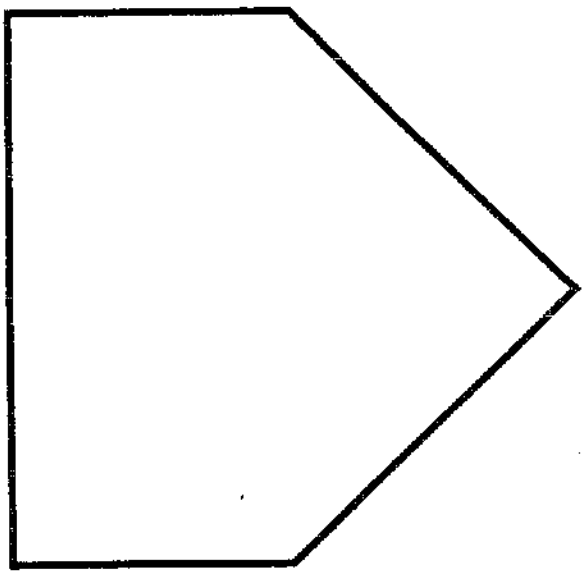


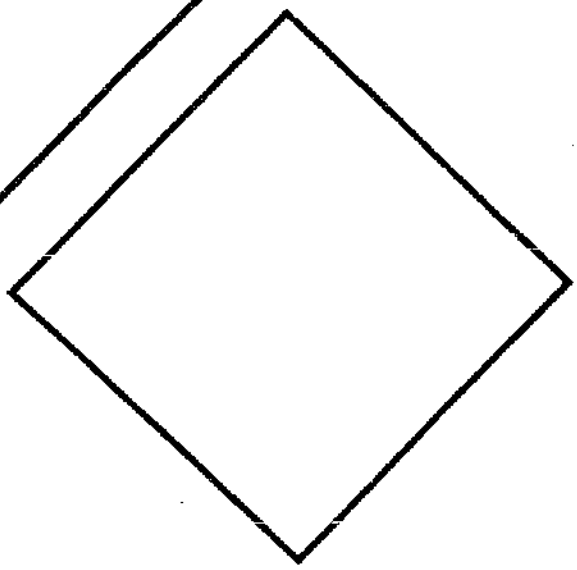
What fraction name would be given to the pieces shown below?



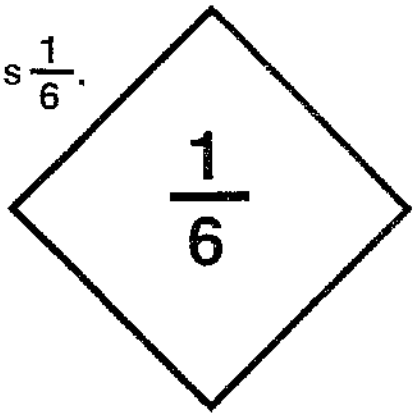




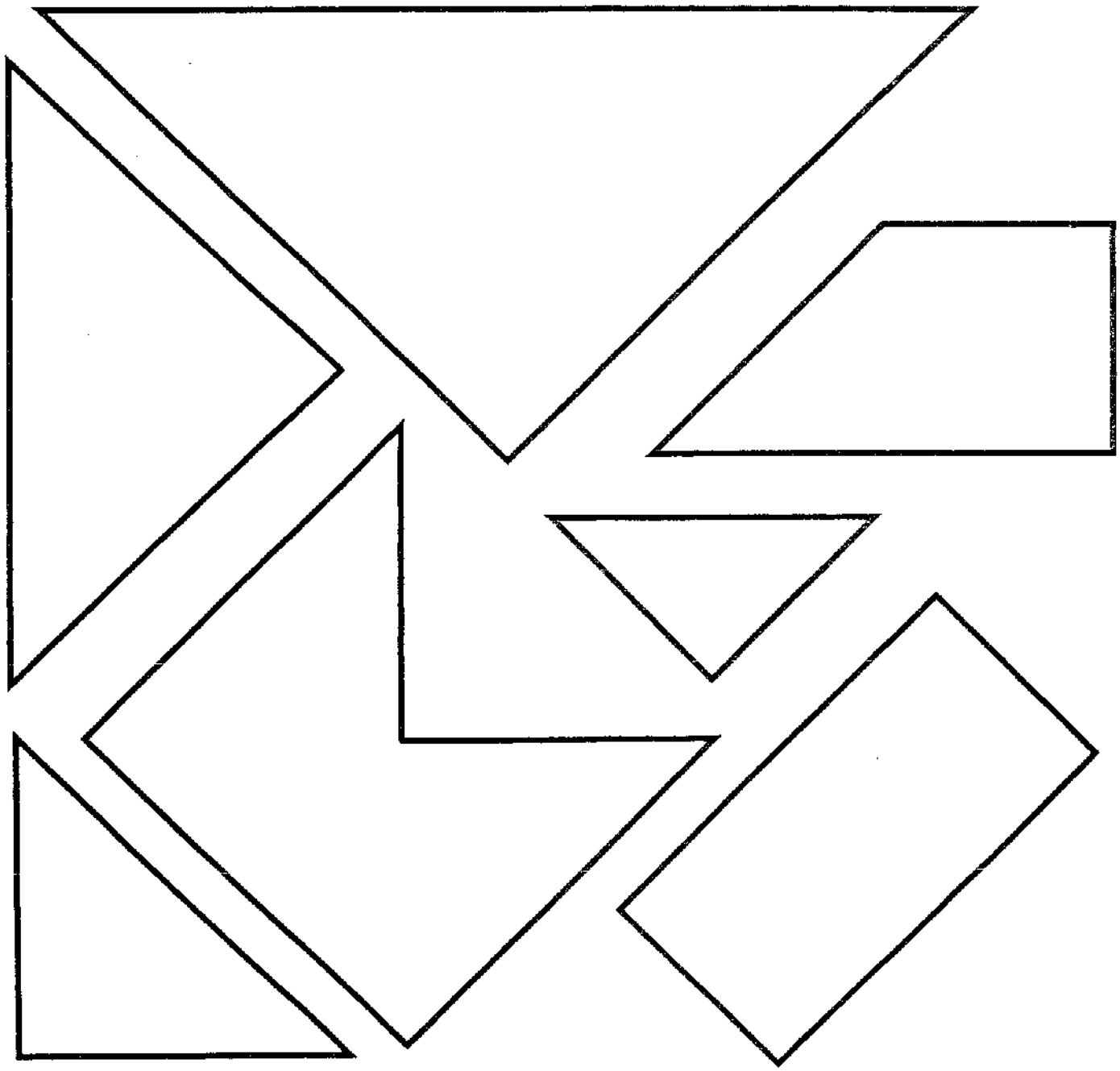




This tangram square is $\frac{1}{6}$.



What fractions are the pieces below?



Word Problems with Fractions
Sorting cards

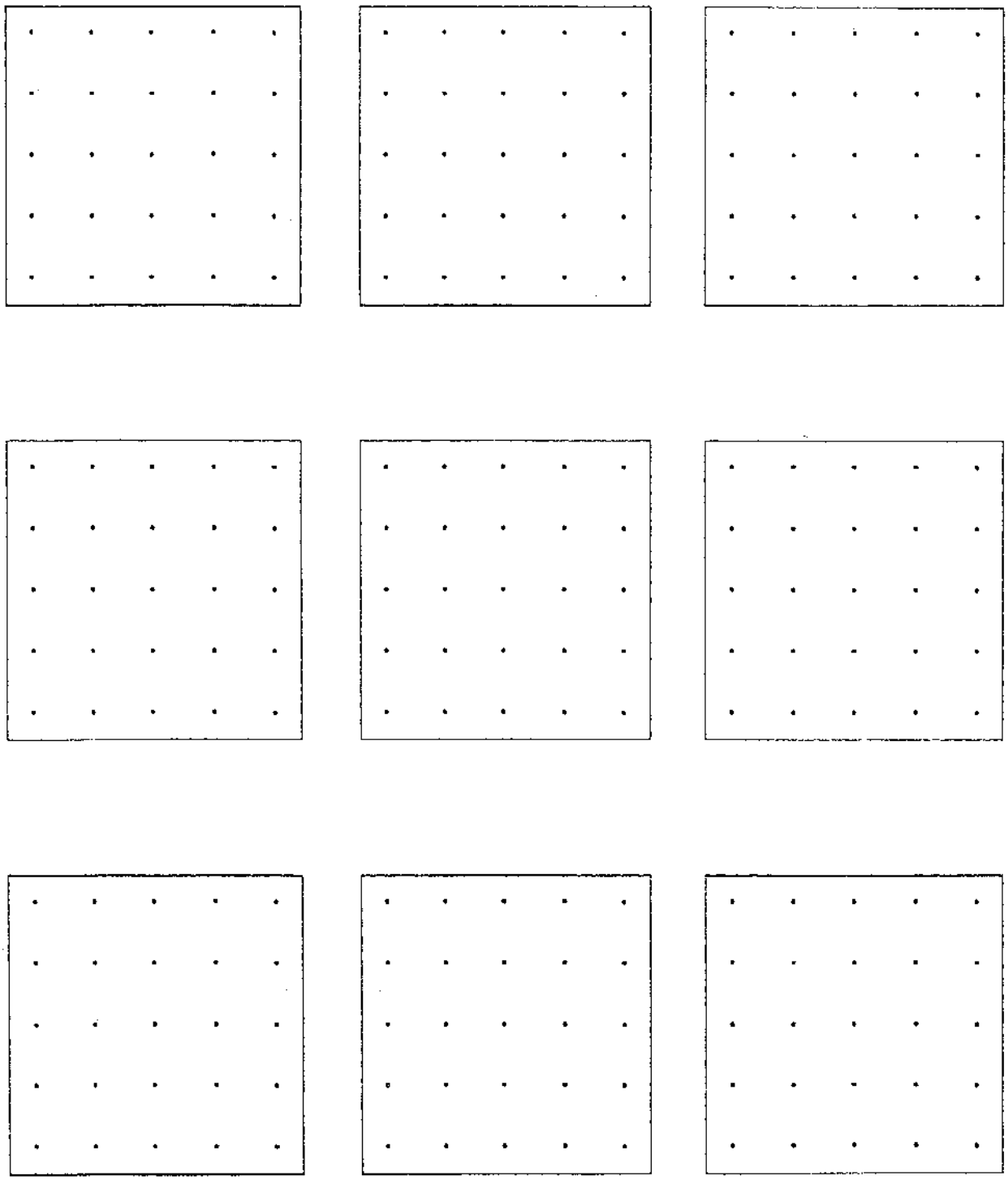
A recipe calls for $\frac{1}{4}$ cup of brown sugar and $\frac{1}{2}$ cup of white sugar. If I put the brown sugar in my one cup measuring cup and then add the white sugar, will I overflow the cup? If not, to what line should I fill the cup with the white sugar?	Josie has a 6-foot length of board. She wants to make shelves that are $1\frac{3}{4}$ feet long. How many shelves can she make?	Dennis ate $\frac{5}{8}$ of a pizza. The group he was with decided he need only pay for $\frac{1}{2}$ of a pizza. How much did he get for free?
Marsha ate $\frac{1}{2}$ of one small pizza and then ate $\frac{1}{3}$ of another small pizza. Does she owe the cost of a whole pizza?	Bill ate $\frac{1}{2}$ of a small pizza and then ate $\frac{2}{3}$ of another small pizza. Does he owe the cost of a whole pizza? … of two pizzas? If a small pizza costs $4.20, how much does he owe to pay a fair share of the bill?	Kris used $\frac{1}{2}$ yard of ribbon to make a Christmas bow. Sharon used $\frac{1}{3}$ of a yard. Who used more? How much more?
Kelly decided to use the same amount of material to make her toddler shorts and a shirt. If the shorts require $\frac{5}{6}$ of a yard of 54" wide material and the shirt requires $\frac{1}{2}$ of a yard of 54" wide material, how much 54" material does she need to buy?	Jo Ann estimated that she will need $1\frac{3}{4}$ gallon of paint to paint her bedroom and she will need $2\frac{2}{3}$ of a gallon to paint her hallway in the same shade. How much paint should she buy?	Tanya and Wendy were in charge of ice cream for the party and decided that $2\frac{1}{4}$ gallons of ice cream would be enough. Wendy said she had $\frac{1}{2}$ gallon left over from her family reunion and she would be glad to contribute that. How much ice cream would Tanya need to bring?

Frankie has $\frac{3}{4}$ of a pound of fudge. She gives Candy $\frac{1}{2}$ of what he has. How much of a pound of chocolate did Candy get?	A recipe calls for $1\frac{1}{2}$ cups of flour. You only have a $\frac{1}{4}$ cup measuring cup to use. How many of your measuring cup should you use?	Lori ran $\frac{3}{8}$ mile and then walked $\frac{1}{4}$ of a mile. How far did she travel?

Ones

Tenths

Geoboard Dot Paper



Teaching Fractions and Decimals Handout 8a

Problem Based Instructional Task Sample Lesson Plan

Lesson Topic:
Grade Level/Course:
Objective:
Pre-requisite Knowledge:
NCTM Standard(s): (shaded)

NCTM Content Standards →	Number & Operations	Algebra	Geometry	Measurement	Data Analysis & Probability
NCTM Process Standards →	Problem Solving	Reasoning & Proof	Communication	Connections	Representation

Materials Needed:

Audio-visual:
Manipulatives:
Literature:
Technology/Software:
Other:

Opening Routine:

Teacher will…

Students will…

Results:

Main Lesson Development:

Launch:

Teacher will…

Students will…

Explore:

Teacher will…

Students will…

Share:

Teacher will...

Students will...

Summarize and Clarify:

Teacher will...

Students will...

Results:

Modifications/Extensions:

Results of Estimating a Fraction Sum

Estimate the answer to $\frac{12}{13} + \frac{7}{8}$

You will not have time to solve the problem using paper and pencil.

Responses for 13 year olds

1	7%
2	24%
19	28%
21	14%

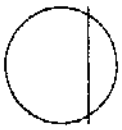
Second Mathematics Assessment of NAEP

What some students think about fractions

What is a fraction?

1. A fraction is one over something.
2. A fraction is always less than one.
3. Improper fractions are not allowed.
4. Fractions always come with the equal parts nicely shown.
5. Whole numbers and fractions are unrelated.
6. Mental math and estimation can work with whole numbers, but not with fractions.
7. Multiplication and division of fraction rules are easy, but they don't make sense.
8. Decimals are easy and fractions are hard.
9. Fractions stink.

Common Student Errors with Fractions



Shows two halves.

$$\frac{2}{4}+\frac{1}{5}=\frac{3}{9}$$

$$\frac{1}{4}>\frac{1}{3}$$

$$5x\frac{2}{3}=\frac{10}{15}$$

$$\frac{5}{6}=5.6$$

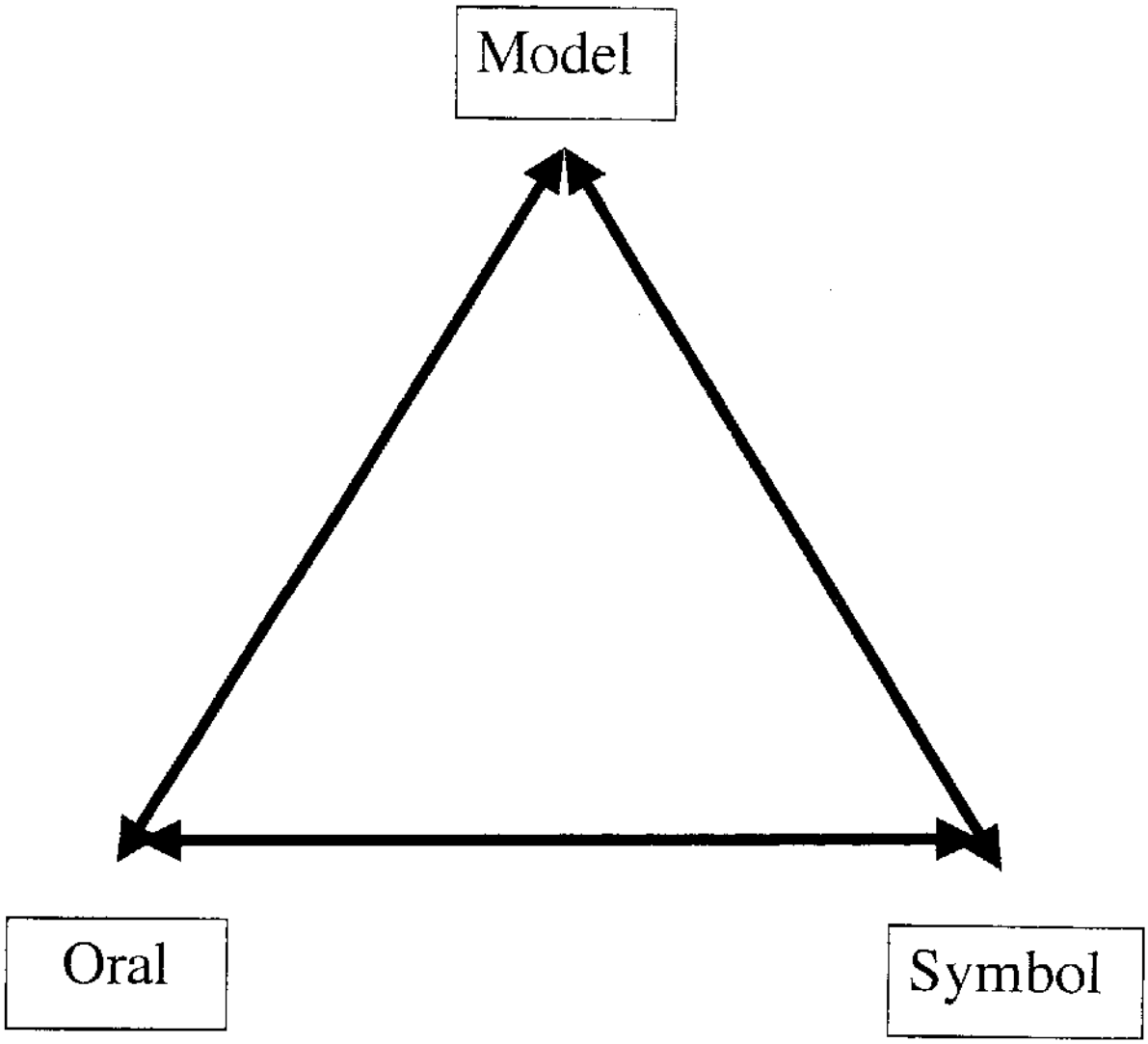
Instruction of Fractions

Usually some limited addition and subtraction of fractions is begun in grade 4, with the development of all the operations for fractions introduced in grade 5. Continual review and reteaching occur in grades 6, 7, and 8. This explosion of procedural knowledge (symbolic rules) at about the fifth grade is generally not supported by strong conceptual knowledge of fraction meanings because the curriculum has not provided time for the complex development that fraction concepts require.

Three Categories of Fraction Models (That can be used, but usually aren't)

- Region or Area models: Fraction circles, fraction bars, tangrams, pattern blocks, geoboards, grid paper, paper folding
- Length or Measurement Models: Fraction strips, Cuisenaire rods, number lines
- Set Models: color tiles, two-sided counters, spray painted lima beans

Model-Oral-Symbol Translations



Fraction Benchmarks

Classify the following fractions as close to 0, $\frac{1}{2}$, or 1.

$\frac{7}{8}$ $\frac{1}{14}$ $\frac{2}{100}$ $\frac{8}{14}$ $\frac{10}{18}$ $\frac{3}{4}$

Finish these fractions so that they are close, but not equal to the benchmarks.

$\frac{8}{\quad}$ $\frac{\quad}{14}$ $\frac{45}{\quad}$ $\frac{\quad}{21}$ $\frac{16}{\quad}$ $\frac{\quad}{34}$

Use only the numbers 5, 6, 7, 8, 9, 10. Make a fraction that is:

Close to 0:

Less than $\frac{1}{2}$:

More than $\frac{1}{2}$:

Close, but less than 1:

More than 1:

Estimating Sums of Fractions and Mixed Numbers

Using benchmarks, estimate the following sums:

1. $\frac{5}{9}+\frac{11}{12}$
2. $\frac{1}{3}+\frac{6}{13}$
3. $\frac{6}{10}+\frac{7}{13}+\frac{3}{4}$
4. $\frac{5}{6}+\frac{10}{11}+\frac{19}{20}$
5. $4\frac{5}{7}+2\frac{3}{8}+6\frac{2}{7}$
6. $3\frac{12}{13}+5\frac{1}{9}+2\frac{4}{7}$

One of the prior fraction exercises can also be done mentally to obtain an exact answer. Which one is it and what is the sum?

Problems with Decimals

1) $\begin{array}{r} 0.7 \\ +0.8 \\ \hline 0.15 \end{array}$

2) $0.125 > 0.9$

3) "Is it all right if I have 2.350?"

4) $0.6\overline{)1.2}$ $\quad .2$

5) $\frac{1}{5} = 1.5$

6) 0.25 is read as 25 tenths

7) $0.3 \times 0.2 = 0.6$